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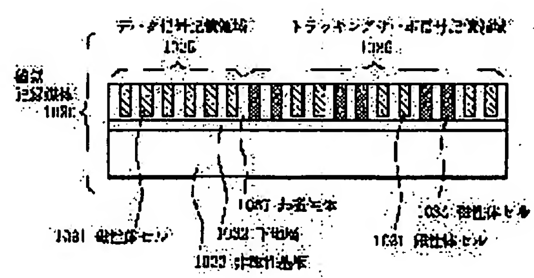
(54) MAGNETIC RECORDING MEDIUM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a magnetic recording medium wherein magnetic characteristics of a cell for a data signal storage area are different from magnetic characteristics of at least a partial cell for a tracking servo signal storage area.
SOLUTION: The magnetic recording medium is constituted by including a data signal storage area 1035 which has a first magnetic substance cell 1031, and a tracking servo signal storage area 1036 which has a second magnetic substance cell 1034. The first and second magnetic substance cells are isolated from each other by a nonmagnetic substance 1037. The first and second magnetic substance cells 1031 and 1034 are different from each other in magnetic characteristics.



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CLAIMS

[Claim(s)]
[Claim 1] Said 1st magnetic-substance cel and the 2nd magnetic-substance cel are a magnetic-recording medium characterized by being the magnetic-recording medium constituted including the data signal storage region which has the 1st magnetic-substance cel, and the tracking servo signal storage region which has the 2nd magnetic-substance cel, and isolating said 1st magnetic-substance cel and the 2nd magnetic-substance cel with non-magnetic material, respectively, and magnetic properties differing mutually.
[Claim 2] Said 1st and 2nd magnetic-substance cels are magnetic-recording media according to claim 1 which are carrying out the pillar-shaped configuration.
[Claim 3] Said 1st magnetic-substance cel and the 2nd magnetic-substance cel are a magnetic-recording medium according to claim 1 by which the magnetic materials with which it fills up differ mutually.
[Claim 4] Said 1st magnetic-substance cel and the 2nd magnetic-substance cel are a magnetic-recording medium according to claim 1 by which the structures of a cel differ mutually.
[Claim 5] Said 1st magnetic-substance cel and the 2nd magnetic-substance cel are a magnetic-recording medium according to claim 1 by which cel volume differs mutually.
[Claim 6] A magnetic-recording medium according to claim 1 with the larger coercive force of said 1st magnetic-substance cel than the coercive force of said 2nd magnetic-substance cel.
[Claim 7] The magnetic-recording medium according to claim 1 which also contains said 1st magnetic-substance cel in said tracking servo signal storage region.
[Claim 8] The magnetic-recording medium according to claim 1 said whose non-magnetic material is anodic oxidation aluminum.
[Claim 9] The magnetic-recording medium according to claim 1 by which the 1st layer which contains at least one of Ti, Zr, Hf, Nb, Ta, Mo, W, or the Si in the lower part of the recording layer which consists of said 1st and 2nd magnetic-substance cels, and the 2nd layer which has conductivity are prepared in this order.

[Translation done.]

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2.**** shows the word which can not be translated.
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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention records information and relates to a reproducible magnetic-recording medium.
[0002]
[Description of the Prior Art] Large capacity-ization with large information recording devices, such as a magnetic recording medium, is called for with fast increase of amount of information in recent years. The hard disk drive unit (HDD:Hard Disk Drive) is always overwhelmingly used as an information recording device for computers in this situation compared with other recording methods a low cost bit unit price and for the high data transfer rate.
[0003] In recent years, the recording density of a hard disk has attained the wonderful figure of the increment in an annual rate of 100%, and there is also a report of having recorded 50 Gb/in2 (7.8 Gb/cm2), on the latest experiment level. However, as for the recording density of a hard disk drive unit, further densification is desired in spite of such a situation.
[0004] Generally the magnetic-recording medium used for a hard disk drive unit is carrying out the disk configuration (a ring-like field is called a truck.). And the truck is classified by the field (it is henceforth called a "tracking servo signal storage region".) where the signal for two or more tracking servos was memorized. In said truck, the field classified in the tracking servo signal storage region turns into a field for data signals (it is henceforth called a "data signal storage region".).
[0005] Writing of data or migration of the magnetic head for read-out is performed as follows. The servo signal memorized in said tracking servo signal storage region is read by the magnetic head, and a head actuator is controlled according to the signal, and it is made to move to the location aiming at the magnetic head. In order to make a tracking servo signal record on a record medium, after producing a magnetic-recording medium, generally using servo writer equipment and writing a tracking servo signal in a record medium is performed.
[0006] However, since advanced control of a signal write-in location is needed when the width of recording track is decreased, in order to make track density (recording density) increase, servo writer equipment must be equipped with the device in which it positions correctly, and the price of servo writer equipment will rise as a result. Moreover, since a signal must be written in many trucks for the increment in track density, the time amount which writes in a tracking servo signal increases further, and a manufacturing cost increases.
[0007] Thus, that a servo signal field must be formed after production of a magnetic-recording medium using the servo writer equipment in which highly precise position control is possible originates in the magnetic properties of a data area and a servo field being the same.
[0008] In order to solve such a problem, the approach of recording a tracking servo signal by change of the thickness of a magnetic layer is indicated by forming a crevice 17 in a substrate 12, as shown in drawing 12 , forming a magnetic layer 15 in the crevice 17, and forming the magnetic-recording layer 13 continuously further on it (for example, patent reference 1 reference.).
[0009]
[Patent reference 1] JP,9-167336,A (the 3rd page, drawing 1)
[0010]
[Problem(s) to be Solved by the Invention] Then, this invention aims at offering the magnetic-recording medium by

which the magnetic properties which the cel for data signal storage regions has differ from the magnetic properties which some [for tracking servo signal storage regions / at least] cels have, and its manufacture approach.
[0011]
[Means for Solving the Problem] The magnetic-recording medium concerning this invention is constituted including the data signal storage region which has the 1st magnetic-substance cel, and the tracking servo signal storage region which has the 2nd magnetic-substance cel, and said 1st magnetic-substance cel and the 2nd magnetic-substance cel are isolated with non-magnetic material, respectively, and it is characterized by magnetic properties differing mutually, as for said 1st magnetic-substance cel and the 2nd magnetic-substance cel.
[0012] As for said 1st and 2nd magnetic-substance cels, it is desirable to carry out the pillar-shaped configuration. Said 1st magnetic-substance cel may be included in said tracking servo signal storage region. moreover, the magnetic-recording medium which has the tracking servo signal storage region in which the magnetic-recording medium concerning this invention is formed including the 1st magnetic-substance cel and the 2nd magnetic-substance cel -- it is -- this -- non-magnetic material separates the 1st magnetic-substance cel and the 2nd magnetic-substance cel -- having -- **** -- and -- this -- the 1st magnetic-substance cel -- this -- the 2nd magnetic-substance cel is characterized by magnetic properties differing mutually.
[0013] Moreover, the magnetic-recording medium concerning this invention is a magnetic-recording medium which has the magnetic-substance cel each other separated with non-magnetic material. The data signal storage region which a magnetic-substance cel is classified by making into a unit the smallest unit magnetic-recording section constituted by said magnetic-substance cel, and comes to arrange said two or more smallest unit magnetic-recording sections, It has the tracking servo signal storage region which comes to arrange said two or more smallest unit magnetic-recording sections. The magnetic properties of the magnetic-substance cel which constitutes a part or all of the smallest unit magnetic-recording section that has been arranged to said tracking servo signal storage region are characterized by differing from the magnetic properties of the magnetic-substance cel which constitutes the smallest unit magnetic-recording section arranged to said data signal storage region.
[0014] The magnetic materials with which it fills up with said 1st magnetic-substance cel and the 2nd magnetic-substance cel, for example differ mutually, the structures of a cel differ mutually, or cel volume differs mutually. It is desirable for the coercive force of said 1st magnetic-substance cel to be larger than the coercive force of said 2nd magnetic-substance cel. It is desirable that said non-magnetic material is anodic oxidation aluminum. The 1st layer which contains at least one of Ti, Zr, Hf, Nb, Ta, Mo, W, or the Si in the lower part of the recording layer which consists of said 1st and 2nd magnetic-substance cels, and the 2nd layer which has conductivity may be prepared in this order. If the above-mentioned magnetic-recording medium is used, since informational writing is magnetically possible, it is applicable to information recording devices, such as a hard disk drive.
[0015]
[Embodiment of the Invention] (1st operation gestalt) This invention is hereafter explained using drawing 1 . Drawing 1 shows the typical sectional view of a magnetic-recording medium. 1030 is a part of magnetic-recording layer, and uses the 2nd magnetic-substance cel 1034 as a tracking servo signal field 1036, using the 1st magnetic-substance cel 1031 as a data signal field 1035. The 1st and 2nd magnetic-substance cels are isolated with non-magnetic material 1037, respectively.
[0016] And as for the 1st magnetic-substance cel and the 2nd magnetic-substance cel, magnetic properties differ. Magnetic properties here are coercive force, residual magnetization, a magnetic anisotropy, saturation magnetization, etc. As for a difference of magnetic properties, it is desirable that there is 10% or more of difference between the 1st magnetic-substance cel and the 2nd magnetic-substance cel, and it is desirable that there is 30% or more of 100% or more of differences still more preferably more suitably. As an upper limit of a difference, it is 500% or less, for example.
[0017] A difference of such magnetic properties is realizable by changing the 1st and 2nd volume and configurations of a cel, or changing the class of magnetic material arranged in a cel. When the classes of magnetic material specifically arranged in the (ii) cel when the structures of the (i) cel itself differ differ, it is the case where the structure and the magnetic material arranged of the cel (iii) itself also differ from each other etc. The structure of a cel is a concept containing the path and the depth of a cel, a configuration, or the volume. When the structure of said 1st cel and 2nd cel is the same, thickness of the recording layer which consists of a magnetic-substance cel and non-magnetic material can

be made the same between said two fields.
[0018] Thus, if magnetic properties differ in the data signal storage region and the tracking servo signal storage region, the need of writing in the signal for tracking servos using the above-mentioned servo writer equipment will be lost after production of a magnetic-recording medium. This point is explained. For example, the case where said 2nd cel (tracking servo signal field) of coercive force is higher is considered rather than said 1st cel (data signal storage region). You impress a magnetic field to the whole recording layer, and make it once magnetized in the 1st direction of the 1st and 2nd cels. Then, if the magnetic field of the reinforcement which magnetization of only the 1st cel reverses is impressed, the sense of magnetization can be made reverse in the 1st cel and 2nd cel.
[0019] In addition, also in case a signal is temporarily written in a tracking servo signal field, the conditions of the position control of servo writer equipment are eased. The magnitude of the magnetic head is larger than a tracking servo signal field, and even when the magnetic field by the magnetic head is impressed also to a data signal field in the case of signal writing, only said 2nd magnetic-substance cel is because the sense of the magnetic moment can gather.
[0020] Moreover, since each magnetic-substance cel can be separated magnetically and a magnetization transition region can be clarified by separating each magnetic-substance cel with non-magnetic material, the noise at the time of signal regeneration can be reduced.
[0021] In addition, in drawing 1 , although the case where the number of the cels in a tracking servo field is two is shown, this is only an example. For example, a configuration as shown in drawing 2 is also possible. Hereafter, the configuration of the magnetic-recording medium applied to this invention based on a drawing is explained.
[0022] Drawing 2 is the sectional view of the example of a configuration of the magnetic-recording medium of this invention. It is characterized by for the magnetic-substance cel which constitutes a part or all of the smallest-unit magnetic-recording section that the magnetic-recording medium given in this drawing had the data-signal storage region which comes to arrange two or more smallest unit magnetic-recording sections, and the tracking servo signal storage region which comes to arrange two or more smallest-unit magnetic-recording sections, and has been arranged in said tracking servo signal storage region to consist of magnetic-substance cels from which the smallest-unit magnetic-recording section arranged to said data-signal storage region and magnetic properties differ. The smallest unit magnetic-recording section here is a part which takes charge of 1-bit record.
[0023] As for the magnetic-recording medium 1030 shown in drawing 2 , the substrate layer 1032 is formed on the nonmagnetic substrate 1033. The data signal field 1035 is constituted including the 1st magnetic-substance cel 1031, and the tracking servo signal field 1036 is constituted by the combination of the 1st magnetic-substance cel 1031 and the 2nd magnetic-substance cel 1034.
[0024] And any cel is separated into each other by non-magnetic material 1037, and it has different magnetic properties in said 1st magnetic-substance cel 1031 and the 2nd magnetic-substance cel 1034. Thus, by having separated the magnetic-substance cels 1031 and 1034 with non-magnetic material 37, it separates into each other magnetically and a magnetization transition region can be clarified. Consequently, it becomes possible to reduce the noise at the time of signal regeneration. Moreover, the substrate layer 32 is not indispensable. Of course, there is no need that the magnetic properties of all the magnetic-substance cels in a tracking servo signal storage region differ from the magnetic properties of the magnetic-substance cel in a data signal storage region.
[0025] A top view shows the example of a configuration of the magnetic-recording medium of this invention to drawing 3 . Each truck consists of a data signal storage region 1035 and a tracking servo signal storage region 1036 like the usual magnetic-recording medium, and the 1st magnetic-substance cel 1031 in the smallest unit magnetic-recording section 1042 which constitutes the data signal storage region 1035 consists of the magnetic substance of the same magnetic properties altogether.
[0026] On the other hand, the 2nd magnetic-substance cel 1034 in a part of smallest unit magnetic-recording sections 1045 which constitute the tracking servo signal storage region 1036 is constituted by the magnetic-substance ingredient of magnetic properties which are different in the data signal storage region 1035 as shown in drawing 3 .
[0027] Moreover, ranging over two recording tracks which adjoin like drawing 3 , the smallest unit magnetic-recording section 1045 in which the magnetic properties in the tracking servo signal storage region 1036 differ from a data signal storage region may be arranged alternately, and it may be arranged so that the signal and phase of a data signal storage region may differ from each other. Depending on the approach of tracking, especially limitation is not carried out for how it is arranged.

[0028] The magnetic-substance cel 1034 in the smallest unit magnetic-recording section 1045 or 1042 or 1031 may be plurality as shown in drawing 3 R> 3, and it may be one. Moreover, the configuration of the smallest unit magnetic-recording section may be made into a square like drawing 3 , a rectangle or a round shape is sufficient and especially the configuration is not limited. Moreover, especially in the case of a square or a rectangle, die length of one side has desirable about 5-200nm.
[0029] Moreover, in this example of a configuration, the magnetic-substance cel may not be regularly arranged, although arranged regularly. Moreover, the case where the part has arranged regularly is sufficient. As for the 2nd magnetic-substance cel 1034 in a part of smallest unit magnetic-recording sections 1045 which constitute the tracking servo signal storage region 1036 shown in drawing 3 , it is more desirable than the magnetic-substance cel 1031 in the smallest unit magnetic-recording section 1042 which constitutes the data signal storage region 1035 to constitute coercive force from an ingredient made high.
[0030] Thus, as an approach of changing the coercive force of a magnetic-substance cel, there are an approach of changing the volume of a magnetic-substance cel, and a method of changing a magnetic-substance ingredient. Moreover, the method of recognizing a tracking servo signal and a data signal is also mentioned by using as a longitudinal magnetic-recording ingredient the ingredient of the magnetic-substance cel which constitutes a tracking servo signal storage region, using a vertical-magnetic-recording ingredient as an ingredient of the magnetic-substance cel which coercive force is not changed, and an easy axis is changed, for example, constitutes a data signal storage region. That is, it is possible to use change of magnetic properties with various magnetic-substance cels (coercive force, residual magnetization, magnetic anisotropy, etc.) as a tracking servo signal.
[0031] As for a difference of magnetic properties, it is desirable that there is 10% or more of difference between the 1st magnetic-substance cel and the 2nd magnetic-substance cel, and it is desirable that there is 30% or more of 100% or more of differences still more preferably more suitably. As an upper limit of a difference, it is 500% or less, for example.
[0032] Moreover, the magnetic-recording medium concerning this invention is possible also for the magnetic-substance cel which constitutes said smallest unit magnetic-recording section as shown in drawing 3 being plurality, and it is possible for the number of the magnetic-substance cels which constitute said smallest unit magnetic-recording section to be also one. When said smallest unit magnetic-recording section is constituted from one magnetic-substance cel, it becomes the so-called pattern DOMEDIA.
[0033] Moreover, the magnetic-recording medium of this invention should just differ from the magnetic-substance cel which the magnetic properties of some [at least] magnetic-substance cels which constitute the smallest unit magnetic-recording section arranged to said tracking servo signal storage region have arranged to said data signal storage region. Of course, the magnetic properties of all the magnetic-substance cels arranged to said tracking servo signal storage region may differ from the magnetic-substance cel arranged to said data signal storage region.
[0034] (Difference of an ingredient) In order to change magnetic properties, it realizes by changing the class of magnetic material with which it fills up in a cel as mentioned above. Thus, by changing the ingredient of a magnetic-substance cel, since the magnetic properties of a tracking servo signal storage region are a lot [freely and] changeable, it becomes possible to clarify the difference of the regenerative signal of a tracking servo signal storage region and a data signal storage region.
[0035] In addition, as an ingredient with which the 1st and 2nd magnetic-substance cels are filled up, it can choose suitably, for example from Co, CoCr, FePt, CoPt, Co/Pd (multilayers of Co and Pd), and a CoCr system alloy.
[0036] If the ingredient chosen from FePt, CoPt, Co/Pd (multilayers of Co and Pd), or a CoCr system alloy is used as a packing material to the magnetic-substance cel in a tracking servo signal storage region, using Co or CoCr as a packing material to the magnetic-substance cel especially in a data signal storage region, since coercive force of the magnetic-substance cel in a tracking servo signal storage region can be made higher than the coercive force of the magnetic-substance cel in a data signal storage region, it is desirable.
[0037] (Difference of the volume) A difference of magnetic properties may be realized by changing the volume of the part which constitutes the smallest unit magnetic-recording section arranged to said tracking servo signal storage region again, or all magnetic-substance cels, and the volume of the magnetic-substance cel which constitutes the smallest unit magnetic-recording section arranged to said data signal storage region.
[0038] Also in such an approach, the magnetic properties of the smallest unit magnetic-recording section which

memorized the tracking servo signal are a lot changeable. For example, when a magnetic-substance cel is formed with the same magnetic material, it becomes possible with constituting so that the aspect ratio of a magnetic-substance cel may become large to enlarge vertical coercive force at a substrate.
[0039] Moreover, the coercive force of the part which constitutes the smallest unit magnetic-recording section arranged to said tracking servo signal storage region, or all magnetic-substance cels may make it higher than the coercive force of the magnetic-substance cel which constitutes the smallest unit magnetic-recording section arranged to said data signal storage region.
[0040] It becomes possible to form in a tracking servo signal storage region the field which has the magnetic domain which becomes the reverse sense mutually by changing the reinforcement of a direct-current field by considering as such a configuration. In addition, the configuration of said 1st and 2nd magnetic-substance cels can be made into a pillar-shaped configuration.
[0041] (Non-magnetic material for isolation between cels) It is a gestalt also with desirable again also being constituted by the layer to which said non-magnetic material which has separated between magnetic-substance cels uses anodic oxidation aluminum as a principal component. By being filled up with a magnetic material in the pore which anodizes the layer (for example, aluminum film) which uses as a principal component the aluminum formed on the substrate layer, and is formed, the record medium from which between magnetic-substance cels was separated with non-magnetic material can be offered.
[0042] moreover, other oxide, such as oxide, and titanium oxide (TiOx), a magnesium oxide (MgOx), tantalum oxide (TaOx), a zinc oxide (ZnOx), or AlN, and SiNx which use the silicon oxide (SiOx) other than anodic oxidation aluminum (AlOx) as a principal component as a non-magnetic material which separates the magnetic-substance cel which adjoins mutually etc. -- a nitride -- semiconductor materials, such as the organic substance, Si, and germanium, can also be used further.
[0043] (Restoration magnetic material) Although it is desirable to use for a substrate the vertical-magnetic-recording ingredient magnetized perpendicularly as a magnetic material in a magnetic-substance cel again, the magnetic-recording ingredient within a field magnetized in parallel with a substrate can also be used.
[0044] As what constitutes a nonmagnetic substrate, usual magnetic-disk substrates, such as a substrate which carried out the coat of the NiP, can be used on a glass substrate, aluminum substrate, a carbon substrate, a resin substrate, a silicon substrate, or these.
[0045] As spacing of a magnetic-substance cel, it is the range of several nm to several 100nm, and is 6-200nm preferably. Moreover, as for the aspect ratio which is a ratio of the height of a magnetic-substance cel, and the magnitude of width of face, it is desirable that it is one to about 20. Furthermore, circular, an ellipse form, and a rectangle can be used for the cross-section configuration where it saw from the substrate bottom of a magnetic-substance cel. as the cross section seen from the substrate bottom of a magnetic-substance cel -- a number - a number -- 10000nm2 the range -- it is -- desirable -- 25-10000nm2 it is . Moreover, when the cross-section configuration seen from the substrate bottom of a magnetic-substance cel is circular, the range of the diameter of the magnetic-substance cel is several nm - hundreds of nm, and it is 5nm - 100nm preferably.
[0046] As an ingredient which constitutes a magnetic-substance cel, what has large saturation magnetization Ms and the large magnetic-anisotropy multiplier Ku is desirable. Specifically, the hard magnetic material which uses Co as a principal component is desirable. For example, Co system alloy which put one element of Cr, Pt, Ta, Nb, Pd, B, Si, Ti, V, Ru, and Rh or two or more kinds of elements into Co is desirable.
[0047] (Substrate layer) By the magnetic-recording medium 1030 of this invention shown in drawing 2 , the substrate layer 1032 is formed between the non-magnetic-material substrate 1033 and non-magnetic material 1037. As an ingredient of this substrate layer, when using a magnetic-recording layer as a perpendicular MAG magnetic material, it is desirable to use the soft magnetic material film as a substrate layer. Moreover, the alloy layer of Cr system or V system may be prepared in the interface of a substrate layer and a recording layer for the purpose, such as crystalline control. Furthermore, when using the non-magnetic material which separates the magnetic-substance cel which adjoins mutually as the oxide which uses anodic oxidation aluminum (AlOx) as a principal component, it is desirable to insert the layer containing at least one element chosen from W, Cu, Ti, Nb, Zn, nickel, Fe, Co, or noble metals in a part of substrate layer. However, a substrate layer is also omissible.
[0048] In addition, as for the lamination of a vertical-magnetic-recording medium, it is desirable to make the 1st layer

(for example, layer containing at least one of Ti, Zr, Hf, Nb, Ta, Mo, W, or the Si) and the 2nd layer (for example, Cu, noble metals, the alloy containing Cu, the alloy containing noble metals, or the layer that has a semiconductor material) which has conductivity the configuration which it has in this order from a recording layer side. This 1st layer has the pore connected with the magnetic-substance cel on it, and it is desirable that the part is also filled up with the magnetic material here.

[0049] Although the example of a configuration shown in drawing 2 does not show, in order to protect a magnetic-recording medium by contact to the magnetic head, protective layers and lubricant, such as amorphous carbon, may be prepared in the front face of a magnetic-recording medium.

[0050] The whole magnetic-recording medium 1030 top view of this invention is shown in drawing 4 . As shown in drawing 4 , as for the magnetic-recording medium 1030 of this invention, the data signal storage region 1035 and the tracking servo signal storage region 1036 are formed at intervals of predetermined on the substrate. The magnetic-substance cel from which magnetic properties differed is formed in the tracking servo signal storage region 1036 (un-illustrating), and tracking is performed by reading it by the magnetic head. Record playback of an information signal is performed in the data signal storage region 1035 by the magnetic head.

[0051] Moreover, a clock field and an address code field may also be included besides the usual tracking servo signal storage region in a tracking servo signal storage region. In addition, in the magnetic storage medium of this invention, although change of the magnetic properties of a magnetic-substance cel was used only for record of a tracking servo signal, it is not what was restricted to this and it cannot be overemphasized that it can use also as a magnetic-recording pattern (ROM) only for playbacks.

[0052] (The 2nd operation gestalt: The manufacture approach) Next, the manufacture approach of the magnetic-recording medium concerning this invention is explained. An example of the manufacture approach of the magnetic-recording medium concerning this invention is explained. The manufacture approach of a magnetic-recording medium of having used anodic oxidation aluminum as a non-magnetic-material ingredient which separates each magnetic-substance cel is shown especially here. The outline of the manufacture approach is shown in drawing 5 and drawing 6 .

[0053] First, as shown in drawing 5 A, Cu which are the soft magnetism layer which is the substrate layer 1051, a substrate layer for electrodeposition, and a substrate electrode layer is formed on the nonmagnetic substrates 1052, such as glass, and the aluminum or the aluminium alloy 1050 used as the basis of a non-magnetic-material ingredient is formed on it. As for the aluminum or the aluminium alloy 1050 used as the basis of the substrate layer 1051 of these, or a non-magnetic-material ingredient, forming with a spatter or vacuum deposition is desirable.

[0054] Next, as shown in drawing 5 B, the stamp (stamper) 1053 with which the convex pattern arranged regularly was formed on hard substrates, such as SiC, is pushed on said aluminum or the aluminium alloy front face 1050 using the electron beam lithography which can form a minute pattern beforehand, it becomes depressed on the front face, and 1054 is formed.

[0055] the hole according [this hollow] to anodizing -- it functions as a start point of formation. In a field (flat field) without a start point, a hole is formed at spacing determined on the class, its concentration, or the anodic oxidation electrical potential difference of the electrolytic solution.

[0056] Therefore, the pattern of the convex configuration formed in a stamp 1053 does not form a hollow in the location which forms the magnetic-substance cel in a data signal storage region, and the cel from which magnetic properties differ among the magnetic-substance cels in the field which writes in tracking servo signaling information (or what is necessary is just to form a hollow smaller than the hollow of a data signal storage region). that is, in the film front face by which anodizing is carried out, it was formed in the data signal storage region at a part of tracking servo signal field [at least] -- becoming depressed (the 1st hollow) -- it differs -- becoming depressed (the 2nd hollow) -- what is necessary is just to prepare In addition, "a different hollow" here includes the hollow where the 1st hollow differs from its size, and the hollow where spacing of a hollow differs. For example, when it changes the 1st hollow and the 2nd hollow in the depth, there should just be 1nm or more 500nm or less of differences of 5nm or more 50nm or less extent preferably, for example. a 3 to about 10nm difference -- the volume of a magnetic-substance cel -- it is applicable if controllable.

[0057] Next, anodizing is performed like drawing 5 C and aluminum or an aluminium alloy is used as the aluminum oxide (anodic oxidation alumina) 1059 with which two or more pores were formed.

[0058] Here, anodic oxidation of aluminum is explained. A nano hole diameter can be controlled by anodic oxidation

of aluminum or an aluminium alloy to several nm - 100nm of numbers, and spacing of a nano hole is also more controllable than a nano hole diameter from a large value a little to about 500nm. Although various kinds of acids are available to anodic oxidation of aluminum or an aluminium alloy, in order to produce the nano hole of detailed spacing, to produce a sulfuric-acid solution and the nano hole of comparatively big spacing and to produce a phosphoric acid solution and the nano hole of magnitude in the meantime, an oxalic acid solution is desirable. Moreover, the diameter of a nano hole is expandable by the approach of etching in solutions, such as phosphoric acid, after anodization.
[0059] In order to produce a nano hole regularly, the approach of producing the hollow which becomes the start point of formation of a nano hole as mentioned above on aluminum or an aluminium alloy front face is effective.
[0060] Moreover, in anodic oxidation of aluminum etc., as for the place in which the hollow is not formed by the location in which the hollow was formed becoming pore preferentially, pore is slowly formed rather than the location in which the hollow was formed. Therefore, the diameter of pore and the depth of pore are large in the location in which the hollow was formed, and become small in the location in which the hollow is not formed. By the above-mentioned manufacture approach, the sample of anodized drawing 5 B becomes anodic oxidation aluminum 1059 in which pore like drawing 5 C was formed.
[0061] In drawing 5 C, 1055 is pore (nano hole) and, as for pore 1055, the diameter and the depth of pore are large rather than pore 1155. such a production approach of pore -- Heisei 13 spring the collection of the 48th applied-physics relation union lecture meeting lecture drafts -- it is shown in "mosaic structure formation in an anodic oxidation porous alumina" carried by No.3p1332.
[0062] Then, it is electrodeposited in order to form Co which is a hard magnetic particle like drawing 6 D. Since the thickness of the anodic oxidation aluminum 1059 of the pars basilaris ossis occipitalis of the pore 1155 of the location in which the hollow is not formed beforehand is thicker than the pore 1055 which had formed the hollow beforehand, the electrical potential differences by which a magnetic material is electrodeposited differ by both pores.
[0063] Here, using the difference, with low electrodeposted potential, Co which is a hard magnetic particle alternatively is electrodeposited only in the pore 1055 which formed the hollow beforehand, and the magnetic-substance cel 1056 is formed.
[0064] In addition, the approach of electrodepositing in the pore of arbitration here by the approach of making the pore from which magnitude differs using a focused ion beam and anodic oxidation as shown in JP,2001-9800,A although how to anodize after forming a hollow with a stamp as an approach of electrodepositing in the pore of arbitration was shown may be used.
[0065] Then, by making an electrodeposted electrical potential difference increase and electrodepositing a magnetic-substance ingredient with still higher coercive force rather than the magnetic-substance ingredient with which it was filled up before, like drawing 6 E, all pores are filled up with a magnetic-substance ingredient, and pore serves as the magnetic-substance cels 1057 and 1058 altogether. Thus, the magnetic properties of a data signal storage region and a tracking servo signal storage region can be changed by changing the ingredient with which it fills up in a cel.
[0066] In addition, when a difference of the magnetic properties between cels needs to be clarified more, the process shown below may be performed. That is, as shown in drawing 6 F, polish, etching, etc. remove a packing material to the predetermined depth. Then, after carrying out flattening of the front face, amorphous carbon is formed by the plasma-CVD method on the surface of a medium as a protective layer (un-illustrating).
[0067] Furthermore, after magnetizing all the magnetic-substance cels 1058 and 1056 to an one direction like drawing 7 A, applying a strong direct-current magnetic field, the magnetic-recording medium of this invention is produced like drawing 7 B by magnetizing only the magnetic-substance cel 1056 of the low ingredient of coercive force to hard flow in a magnetic field weaker than drawing 7 A.
[0068] In the above-mentioned manufacture approach, it is characterized by changing the depth of the pore of some [at least] cels (2nd magnetic-substance cel), the depth of the pore of a cel [in / for a magnetic-substance ingredient / a data signal storage region] (1st magnetic-substance cel), and the magnetic-substance ingredient in a tracking servo signal storage region.
[0069] The magnetic-recording medium concerning this invention is realizable by the method of changing an aperture between the 1st and 2nd magnetic-substance cels besides the above-mentioned approach, or the method of changing the metal layer used for a substrate layer in the lower part of the 1st and 2nd magnetic-substance cels, respectively.
[0070] An aperture is controllable by arrangement and the depth of a pore start point as mentioned above. Moreover,

after forming pore with uniform size, only the pore of a predetermined part may be made to extend and an aperture may be controlled.
[0071] If the metal layer especially used for a substrate layer is changed in the lower part of the 1st and 2nd magnetic-substance cels, respectively, since the electrodeposted electrical potential difference at the time of being filled up with a magnetic material in a cel is changeable, a packing material can be changed even if the size of a cel is both identitas.
[0072]
[Example] Example 1 this example is related with a different magnetic-recording medium from the volume of the magnetic-substance cel from which the volume of the magnetic-substance cel which constitutes a part of smallest unit magnetic-recording sections arranged to the tracking servo signal storage region constitutes the smallest unit magnetic-recording section arranged to the data signal storage region.
[0073] Outline process drawing of the manufacture approach of this example is shown in drawing 8 and drawing 9 . First, the aluminum film 7013 was continuously produced [produced Ti which is the substrate layer 7012 by 10nm with spatter vacuum deposition, and / by the spatter] Cu in thickness of 20nm and formed in thickness of 150nm with spatter vacuum deposition on the silicon substrate which is the nonmagnetic substrate 7011 (drawing 8 A).
[0074] Next, the focused ion beam was irradiated on the aluminum front face at regular spacing, it became depressed on the aluminum front face, and 7014 and 7015 were formed. Here, it was referred to as 30nm of diameters of an ion beam, and ion current 3pA, and residence time of a focused ion beam was set [in a part of data signal storage region and tracking servo signal storage region] to 30msec(s) for the residence time of a focused ion beam at 10msec(s) and the remaining tracking servo signal storage regions (drawing 8 B).
[0075] Consequently, as shown in drawing 8 B, the big hollow 15 was formed in aluminum front face of the tracking servo signal storage region which set residence time of a focused ion beam to 30msec(s), and the hollow 7014 smaller than it was formed in aluminum front face of a data signal storage region and the remaining tracking servo signal storage regions. Here, spacing of each hollow 7015 in a data signal storage region was set to 100nm, and the smallest unit magnetic-recording section consisted of one magnetic-substance cel. The surface recording density of the magnetic-recording medium produced as a result is equivalent to 65 Gbits/in2 (10 Gbits/cm2).
[0076] Next, this was anodized by impressing electrical-potential-difference:40V in an oxalic acid water solution (concentration 0.3 mol/l) and 16 degrees C. Spacing of the alumina nano holes 7116 and 7016 anodized on such conditions was 100nm (drawing 8 C). Next, although not shown in drawing, it dipped for 40 minutes in a phosphoric acid water solution (concentration 5wt%) and 20 degrees C, and the aperture was expanded. Consequently, as shown in drawing 8 C, since anodic oxidation progressed preferentially, the volume of the nano hole 7116 of the location in which the big hollow was formed was large compared with the volume of the nano hole 7016 formed in the place in which the small hollow was formed.
[0077] Moreover, the average aperture of the alumina nano hole 7116 was about 70nm. Next, to all the anodic oxidation alumina nano holes 7116 and 7016 produced in this way, it was filled up with Co which is a ferromagnetic all over the nano hole, and the magnetic-substance cel 7117 with the large magnetic-substance volume and the magnetic-substance cel 7017 with the small magnetic-substance volume were formed (drawing 9 D).
[0078] Here, the water solution which consists of cobalt sulfate (II)7 hydrate (concentration 0.2 mol/l) and boric acid (concentration 0.3 mol/l) was used for electrodeposition of Co at 24 degrees C. Electrodeposition was performed by -5.0V in the above solution, using Ag/AgCl as a reference pole. Furthermore, the electrodeposted object which overflowed this sample on the front face using 1/4-micrometer diamond slurry was ground and removed. At this time, surface r.m.s (root-mean-square) was 1nm or less.
[0079] In addition, vertical coercive force was 1000 (Oe) at the place and substrate which measured the coercive force of the magnetic-substance cel 7117 with the large magnetic-substance volume with the sample oscillatory type magnetometer, and the coercive force of the perpendicular direction of the magnetic-substance cel 7017 with the small magnetic-substance volume was 1800 (Oe).
[0080] Moreover, like drawing 9 E, after magnetizing all the magnetic-substance cels 7117 and 7017 in the uniform direction, the field for making an opposite direction magnetize the magnetic-substance cel (small magnetic-substance cel of coercive force) 7117 with the large magnetic-substance volume like the point was impressed to the magnetic-recording medium produced as mentioned above like drawing 9 F in the tracking servo signal storage region.
[0081] Consequently, since the place which observed the obtained magnetic-recording medium under the magnetic

force microscope, and the magnetic-substance cel 7017 with the small volume of pore had high coercive force, it was confirmed that reversal is not performed. Moreover, as compared with the case where non-magnetic material does not separate the place and magnetic-substance cel which observed the magnetization transition region of the flux reversal section in a tracking servo signal storage region, it had clarified under the magnetic force microscope.
[0082] Next, the S/N ratio of the place which reproduced the tracking servo signal, and a regenerative signal increased about 15% as compared with the case where non-magnetic material does not separate a magnetic-substance cel, using the MR head.
[0083] Moreover, the example of arrangement of the servo pattern in this example was shown in drawing 10 . Immediately after record-medium production, magnetization of some magnetic-substance cels 8026 of the tracking servo signal storage region 8024 is reversed with the magnetization direction of other magnetic-substance cels 8027, and the reversed magnetic-substance cel 8026 is alternately arranged ranging over two adjoining recording tracks as shown in drawing 10 . In addition, 8023 and 8025 show the data signal storage region. In this example, although the magnetization direction of the magnetic substance was perpendicularly used as the substrate, it does not limit to this and the same effectiveness as the case where it is magnetized to a substrate and a parallel direction is acquired.
[0084] Example 2 drawing 2 is the sectional view of the second example of the magnetic-recording medium of this invention. The magnetic-recording medium 1030 of this invention consists of magnetic-substance cels 1031 and 1034 separated on the silicon substrate which is the nonmagnetic substrate 1033 with Ti and Cu which are the substrate layer 1032, and the anodic oxidation aluminum which is non-magnetic material 1037 like an example 1.
[0085] Moreover, the magnetic-substance cel 1034 differs in the volume of the magnetic substance from the magnetic-substance cel 1031. In addition, 1035 shows a data signal storage region, 1036 shows the tracking servo signal storage region, and the magnetic material in a magnetic-substance cel is Co.
[0086] Moreover, drawing 3 shows the top view of the magnetic-recording medium in this example. Although the example 1 constituted the smallest unit magnetic-recording section from one magnetic-substance cel, four magnetic-substance cels 1034 and 1031 (for this, a magnetic-substance cel is [a magnetic-substance cel] two perpendicularly at two to the truck cross direction) constituted the smallest unit magnetic-recording sections 1042 and 1045 from this example.
[0087] Since it is the same as that of an example 1, the production approach is omitted. By the magnetic-recording medium of this example, the pitch of an adjoining nano hole is set to 50nm, an average aperture is set to 40nm, and the surface recording density of the magnetic-recording medium produced as a result is equivalent to 65 Gbits/in2 (10 Gbits/cm2).
[0088] As shown in drawing 3 , each truck consists of a data signal storage region 1035 and a tracking servo signal storage region 1036 like the usual magnetic-recording medium, and the magnetic-substance cel 1031 in the smallest unit magnetic-recording section 1042 which constitutes the data signal storage region 1035 consists of a magnetic-substance cel of the same magnetic-substance volume altogether.
[0089] On the other hand, the volume of the magnetic substance differs in the magnetic-substance cel 1031 which the magnetic-substance cel 1034 in a part of smallest unit magnetic-recording sections 1045 which constitute the tracking servo signal storage region 1036 has in the data signal storage region 1035. Moreover, the smallest unit magnetic-recording section 1045 which consists of magnetic-substance cels 1034 from which the magnetic-substance volume differs has been alternately arranged like an example 1 also here ranging over two adjoining recording tracks.
[0090] Thus, the effectiveness as an example 1 also with the produced almost same magnetic-recording medium 1030 was acquired. Moreover, in this example, although the number of the magnetic-substance cels which constitute the smallest unit magnetic-recording section is set to four, it is not limited to this, and one or more should just be two or more preferably.
[0091] Example 3 this example is related with a different magnetic-recording medium from the ingredient of a magnetic-substance cel with which the ingredient of the magnetic-substance cel which constitutes a part of smallest unit magnetic-recording sections arranged to the tracking servo signal storage region constitutes the smallest unit magnetic-recording section arranged to the data signal storage region.
[0092] Outline process drawing of the manufacture approach of this example is shown in drawing 5 and drawing 6 . First, aluminum 1050 also produced [produced Ti which is the substrate layer 1051 by 10nm with spatter vacuum deposition, and / by the spatter] Cu in thickness of 20nm and formed membranes in thickness of 150nm with spatter

vacuum deposition continuously on the silicon substrate which is the nonmagnetic substrate 1052 (drawing 5 A).
[0093] Next, the stamp 1053 which had beforehand the projection which carried out the regular array to a part of data signal storage region and tracking servo signal storage region on the SiC substrate was pressed on aluminum front face using electron beam lithography (drawing 5 B). Consequently, as shown in drawing 5 B, the hollow 1054 of fixed spacing was formed only in some aluminum front faces of a data signal storage region and a tracking servo signal storage region.
[0094] Here, spacing of the hollow 1054 in a data signal storage region was set to 100nm, and the smallest unit magnetic-recording section consisted of one magnetic-substance cel. The surface recording density of the magnetic-recording medium produced as a result is equivalent to 65 Gbits/in2 (10 Gbits/cm2). Next, this was anodized by having impressed electrical-potential-difference:40V in an oxalic acid water solution (concentration 0.3 mol/l) and 16 degrees C, and the anodic oxidation alumina nano holes 1055 and 1155 were formed (drawing 5 C).
[0095] Spacing of the alumina nano hole anodized on such conditions was 100nm. Next, it dipped for 30 minutes in a phosphoric acid water solution (concentration 5wt%) and 20 degrees C, the aperture was expanded, and the average aperture of the alumina nano hole 1055 was set to about 80nm. Since anodic oxidation progressed to the low section of the alumina nano hole (pore) 1055 of the location currently beforehand formed in the hollow at this time preferentially, Cu which is a substrate layer was exposed to it, good conductivity was shown in it, but since anodic oxidation aluminum 1059 remained in the low section of the alumina nano hole (pore) 1155 formed in the place in which the hollow is not formed on the other hand, conductivity was low. Consequently, it becomes possible to fill up each nano hole with a separate ingredient by changing the electrodeposted electrical potential difference of the magnetic substance with which each nano hole is filled up.
[0096] Next, it was filled up with Co which is a ferromagnetic all over the nano hole to a part of anodic oxidation alumina nano hole produced in this way. It was first filled up with Co to some nano holes of the nano hole 1055 of the location currently beforehand formed in the hollow, i.e., a data signal storage region, and a tracking servo signal storage region, and Co restoration magnetic-substance cel 1056 was produced. Here, the water solution which consists of cobalt sulfate (II)7 hydrate (concentration 0.2 mol/l) and boric acid (concentration 0.3 mol/l) was used for electrodeposition of Co at 24 degrees C. Electrodeposition was performed by -2.0V in the above solution, using Ag/AgCl as a reference pole.
[0097] Next, compared with Co, the alumina nano hole 1155 formed in the place in which the hollow which are the remaining nano holes is not formed was filled up with the CoPt alloy with high coercive force, and the CoPt restoration magnetic-substance cel 1058 was produced.
[0098] Here, what mixed 6 chloroplatinic-acid 6 hydrate (concentration 0.1 mol/l) by :(cobalt sulfate (II) 7 hydrate + boric acid) 6 chloroplatinic-acid 6 hydrate =1:1 in the water solution which consists of cobalt sulfate (II)7 hydrate (concentration 0.2 mol/l) and boric acid (concentration 0.3 mol/l) was used for electrodeposition of CoPt at 24 degrees C. Electrodeposition was performed by -5.0V in the above solution, using Ag/AgCl as a reference pole. Furthermore, the electrodeposted object which overflowed these samples on the front face using 1/4-micrometer diamond slurry was ground. At this time, surface Rms was 1nm or less.
[0099] In addition, the place and coercive force which measured the coercive force of the magnetic-substance cel with which Co was filled up with the sample oscillatory type magnetometer were 1800 (Oe), and the coercive force of the magnetic-substance cel with which the CoPt alloy was filled up was 2500 (Oe).
[0100] Next, it was magnetized by the approach which showed the magnetic-recording medium produced by drawing 5 and drawing 6 to drawing 7 . First, after magnetizing all the magnetic-substance cels 1056 and 1058 in the uniform direction, the field for making an opposite direction magnetize like the point the magnetic-substance cel 1056 with which Co with small coercive force was filled up was impressed to all fields.
[0101] As for the place which observed the magnetic-recording medium made as a result under the magnetic force microscope, and the magnetic-substance cel filled up with the high CoPt alloy of coercive force, it was confirmed that flux reversal is not performed. Moreover, the magnetization transition of a flux reversal field seen under the magnetic force microscope had clarified as compared with the case where non-magnetic material does not separate a magnetic-substance cel.
[0102] Next, as compared with the approach, i.e., the approach which changed only the thickness of a magnetic layer, of the S/N ratio of the place which reproduced the tracking servo signal, and a regenerative signal being kept high as

compared with the case where non-magnetic material does not separate a magnetic-substance cel, using the MR head, and changing only the depth of a magnetic-substance cel, as for the S/N ratio of a regenerative signal, the direction of the approach of changing the ingredient of the magnetic substance increased about 20%.
[0103] In addition, the example of arrangement of the servo pattern in this example was made to be the same as that of drawing 10 . Magnetization has reversed a part of tracking servo signal storage region, and the reversed field is alternately arranged ranging over two adjoining recording tracks as shown in drawing 10 .
[0104] Example 4 drawing 11 is the sectional view of the 4th example of the magnetic-recording medium of this invention. Although the example 3 constituted the smallest unit magnetic-recording section from one magnetic-substance cel, four magnetic-substance cels constituted the smallest unit magnetic-recording section from this example. In drawing 11 , Ti and Cu9066 of a substrate layer are [the anodic oxidation aluminum whose 9061 is a data signal record section and a magnetic-substance cel and whose 9064 a tracking servo signal storage region, and 9062 and 9063 are non-magnetic material, respectively for 9060, and 9065] silicon of a nonmagnetic substrate.
[0105] Moreover, magnetic materials differed, and the magnetic-substance cel 9063 and the magnetic-substance cel 9062 used the magnetic material in the magnetic-substance cel 9062 as the CoPt alloy here, and set the magnetic-substance ingredient in the magnetic-substance cel 9063 to Co.
[0106] Thus, with constituting, vertical coercive force differed in the substrate of the magnetic-substance cel 9062 and the magnetic-substance cel 9063. The place and coercive force which specifically measured the coercive force of the magnetic-substance cel 9063 with which Co was filled up with the sample oscillatory type magnetometer were 1800 (Oe), and the coercive force of the magnetic-substance cel 62 with which the CoPt alloy was filled up was 2500 (Oe).
[0107] Since it is almost the same as that of an example 3, the production approach is omitted. The smallest unit magnetic-recording section consisted of magnetic-recording media of this example in four nano holes, having used the pitch of an adjoining nano hole as 50nm. The surface recording density of the magnetic-recording medium produced as a result is equivalent to 65 Gbits/in2 (10 Gbits/cm2).
[0108] Moreover, the example of arrangement of the servo pattern in this example was made to be the same as that of drawing 3 . Immediately after record-medium production, the magnetic-substance cel 1034 in a part of smallest unit magnetic-recording sections 1045 of the tracking servo signal storage region 1036 is magnetized by the magnetic-substance cel 1031 and opposite direction in the data signal storage region 1035, and the smallest unit magnetic-recording section 1045 is alternately arranged ranging over two adjoining recording tracks as shown in drawing 3 . Moreover, the smallest unit magnetic-recording section 1042 in the data signal storage region 1035 consists of four magnetic-substance cels 1031. Moreover, the sense of magnetization of the magnetic-substance cel 1034 and the magnetic-substance cel 1031 is an opposite direction here.
[0109] Thus, the effectiveness as an example 3 also with the produced almost same magnetic-recording medium was acquired. Moreover, in this example, although the number of the magnetic-substance cels which constitute the smallest unit magnetic-recording section was set to four, it did not limit to this, but one or more should just be two or more preferably.
[0110]
[Effect of the Invention] According to this invention, offer of the magnetic-recording medium by which the magnetic properties which were explained above, and which the cel for data signal storage regions has differ from the magnetic properties which some [for tracking servo signal storage regions / at least] cels have is [like] possible.

[Translation done.]

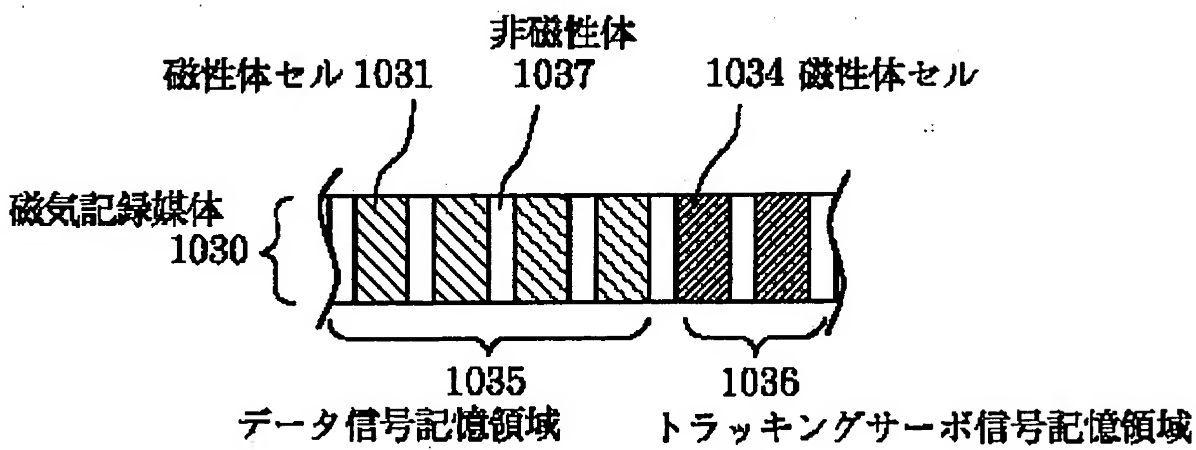
* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view showing an example of the magnetic-recording medium of this invention.
[Drawing 2] It is the sectional view showing an example of the magnetic-recording medium of this invention.
[Drawing 3] It is drawing showing a part of example of a configuration of the magnetic-recording medium of this invention.
[Drawing 4] It is the top view showing a part of example of a configuration of the magnetic-recording medium of this invention.
[Drawing 5] It is cross-section process drawing for explaining an example of the manufacture approach of the magnetic-recording medium of this invention.
[Drawing 6] It is cross-section process drawing for explaining an example of the manufacture approach of the magnetic-recording medium of this invention.
[Drawing 7] It is cross-section process drawing for explaining an example of the manufacture approach of the magnetic-recording medium of this invention.
[Drawing 8] It is cross-section process drawing for explaining an example of the manufacture approach of the magnetic-recording medium of this invention.
[Drawing 9] It is cross-section process drawing for explaining an example of the manufacture approach of the magnetic-recording medium of this invention.
[Drawing 10] It is drawing showing a part of example of a configuration of the magnetic-recording medium of this invention.
[Drawing 11] It is drawing showing a part of example of a configuration of the magnetic-recording medium of this invention.
[Drawing 12] It is the sectional view showing the conventional magnetic-recording medium.
[Description of Notations]
11 Magnetic-Recording Medium
12 Substrate
13 Magnetic-Recording Layer
14 Protective Layer
15 Magnetic Layer
17 Crevice
1030 Magnetic-Recording Medium
1033, 1052, 7011, 8021, 9066 Nonmagnetic substrate
1032, 1051, 7012, 9065 Substrate layer
1050 7013 Aluminum (aluminum)
1054, 7014, 7015 Hollow
1055, 1155, 7016, 7116 Nano hole (pore)
1031, 1034, 1056, 1057, 1058, 7017, 7117, 8026, 8027, 9062, 9063 Magnetic-substance cel
8022 Non-magnetic Layer
1037 9064 Non-magnetic material 1042 and 1045 Smallest unit magnetic-recording section

1053 Stamp
A, 1035, 8023, 8025, 9061 Data signal storage region
B, 1036, 8024, 9060 Tracking servo signal storage region

[Translation done.]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1037
磁性体セル 1031
1034 磁性体セル
磁気記録媒体
1030
1035
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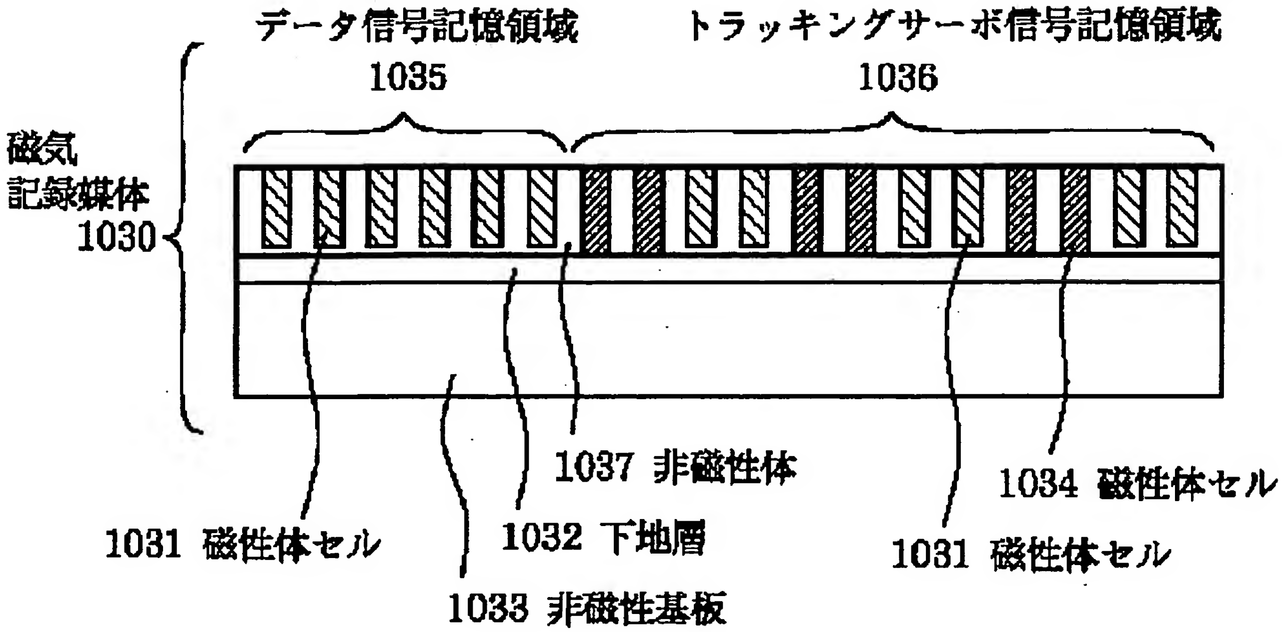
1036
トラッキングサーボ信号記憶領域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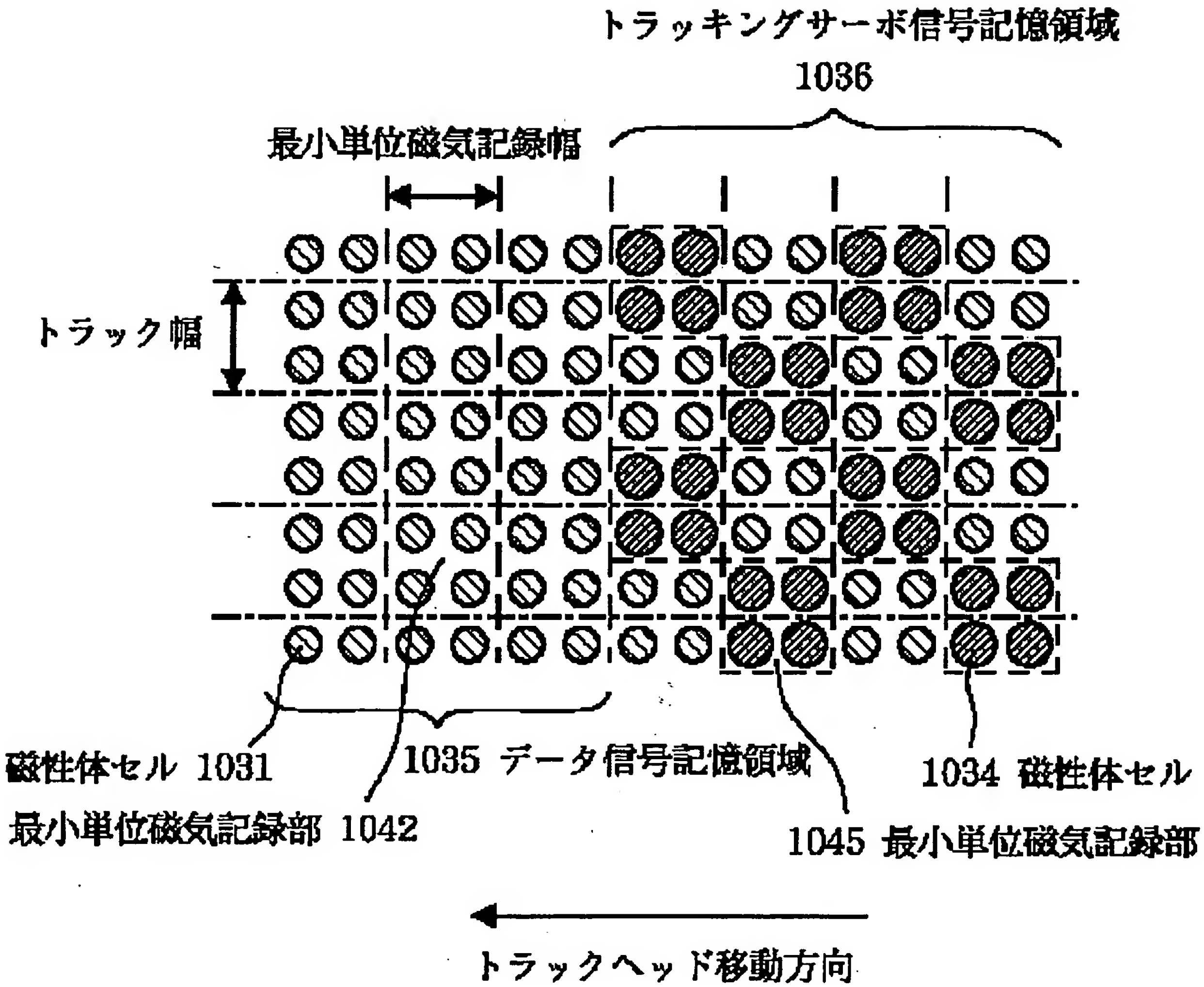
トラッキングサーボ信号記憶領域
1036
磁気
記録媒体
1030
1037 非磁性体
1034 磁性体セル
1031 磁性体セル
1032 下地層
1031 磁性体セル
1033 非磁性基板


トラッキングサーボ信号記憶領域
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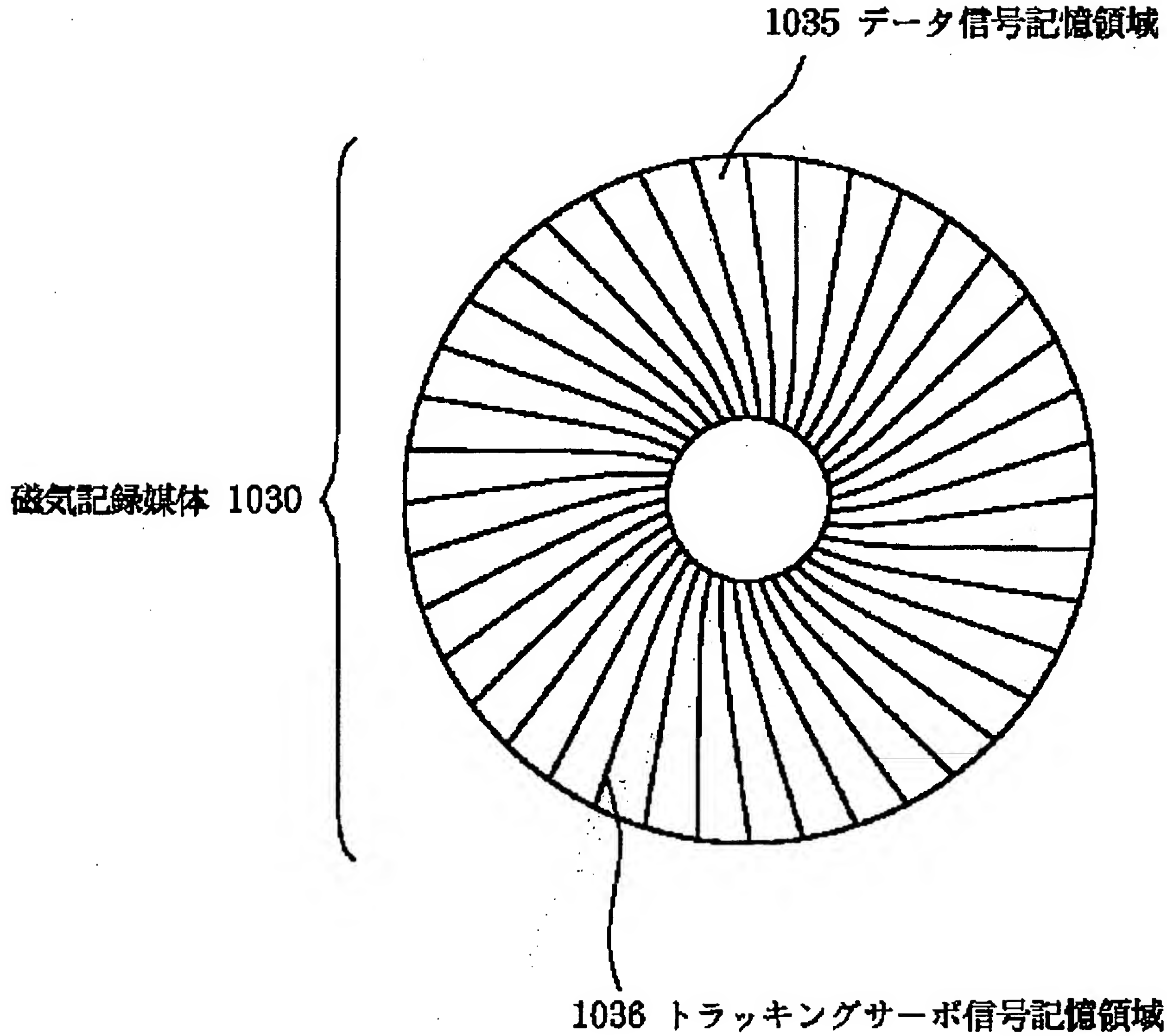
トラック幅
磁性体セル 1031
最小単位磁気記録部 1042
1035 データ信号記憶領域
1034 磁性体セル
1045 最小単位磁気記録部
トラックヘッド移動方向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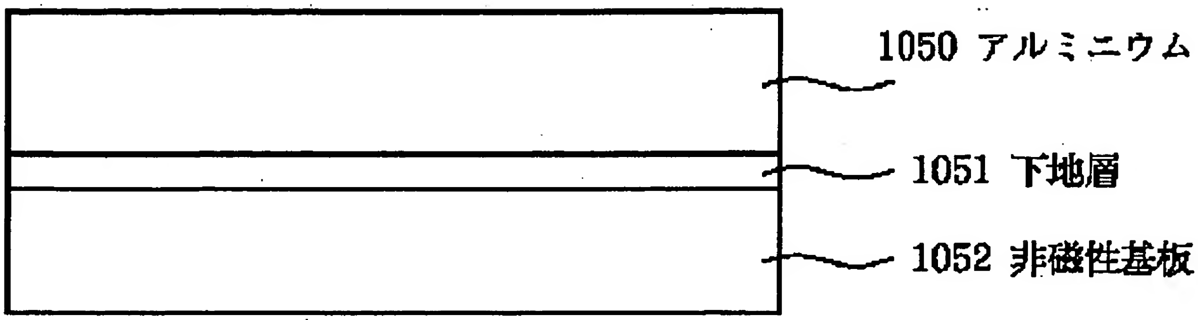
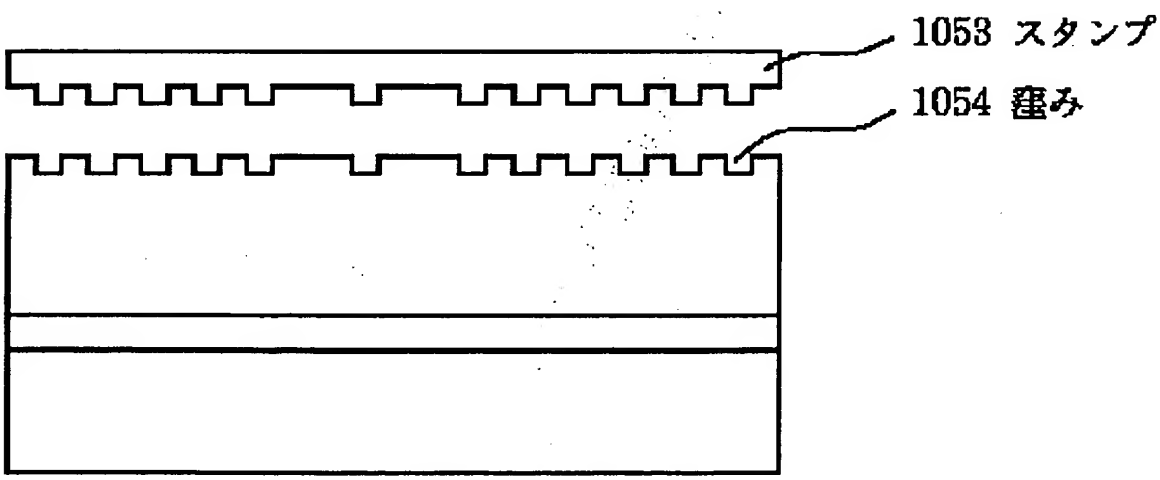
1036 トラッキングサーボ信号記憶領域

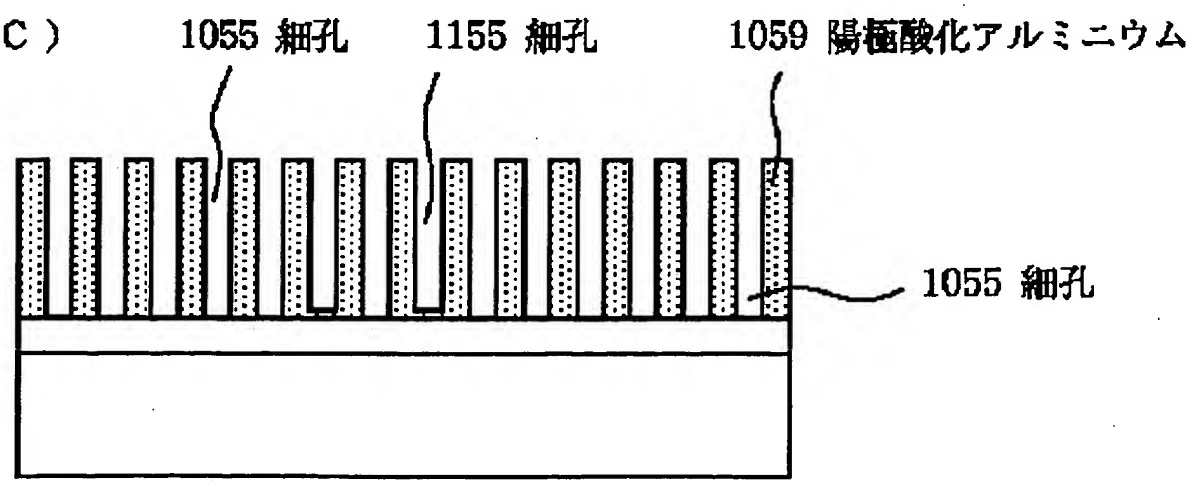
(A)


1050 アルミニウム
1051 下地層
1052 非磁性基板

(B)


1053 スタンプ
1054 窪み

(C)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1055 細孔

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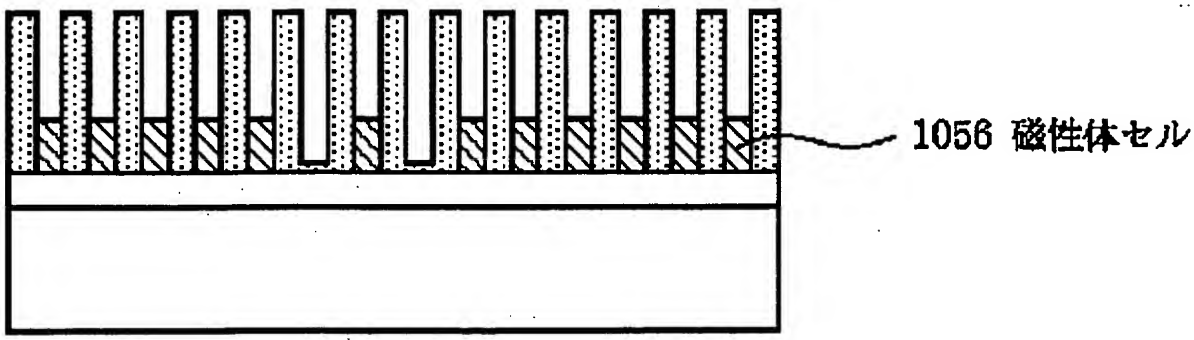

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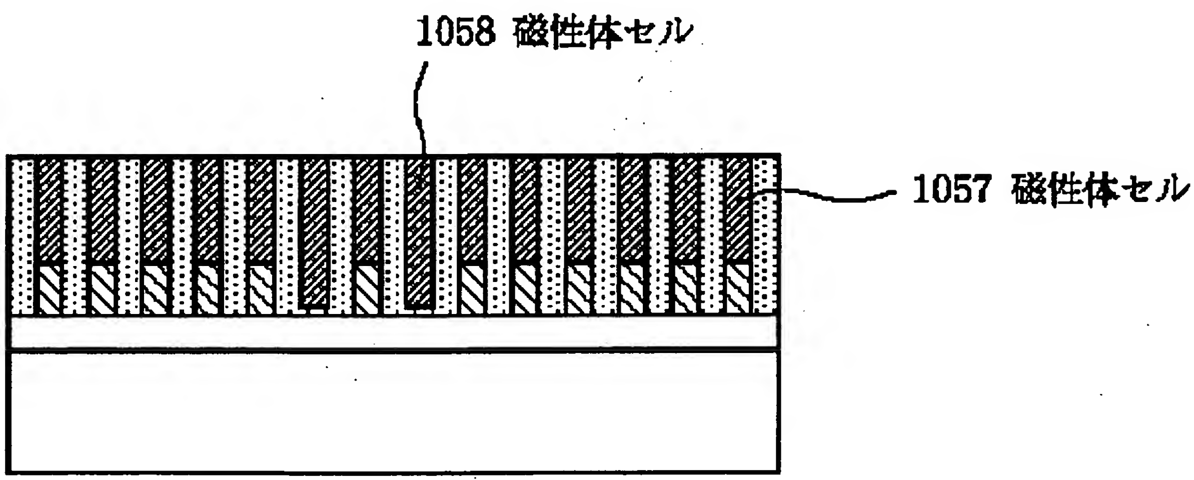

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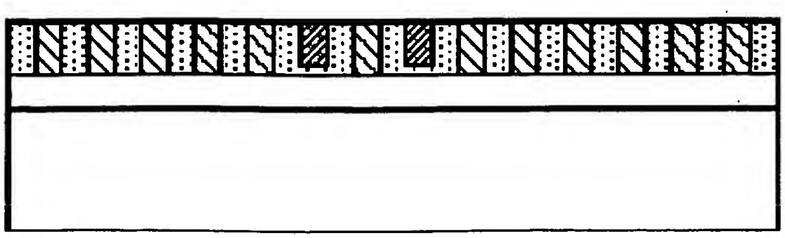

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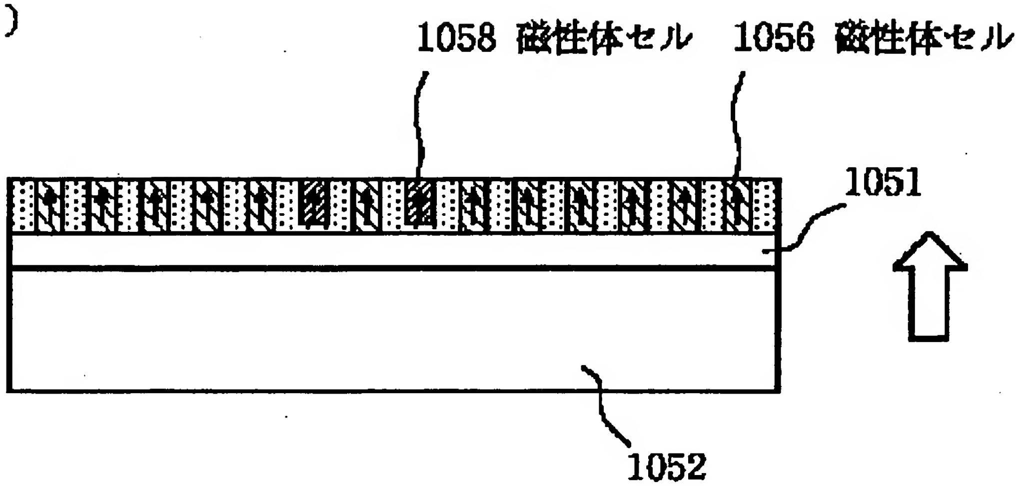

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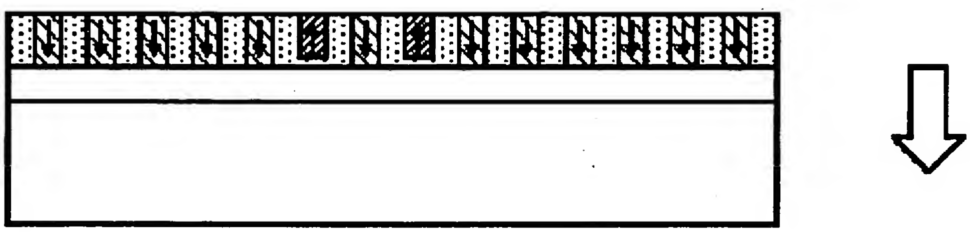

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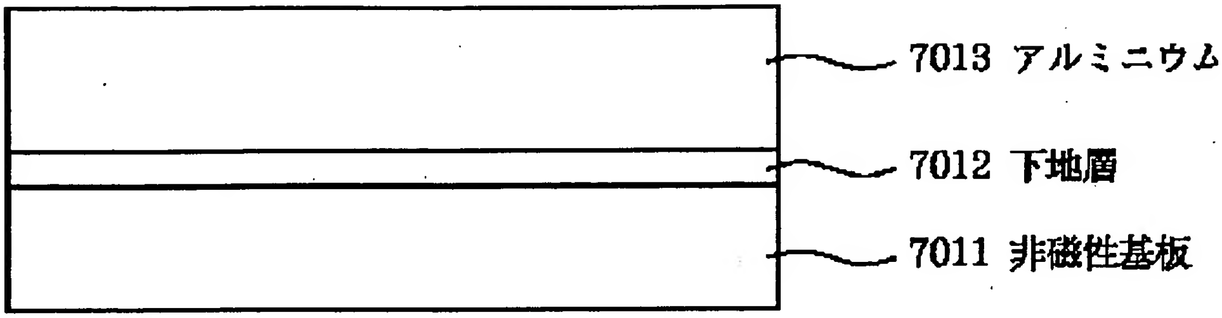
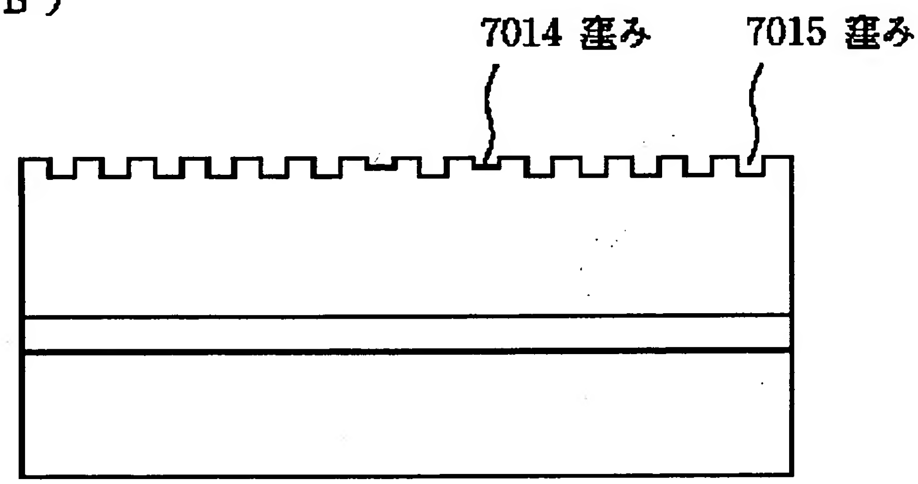
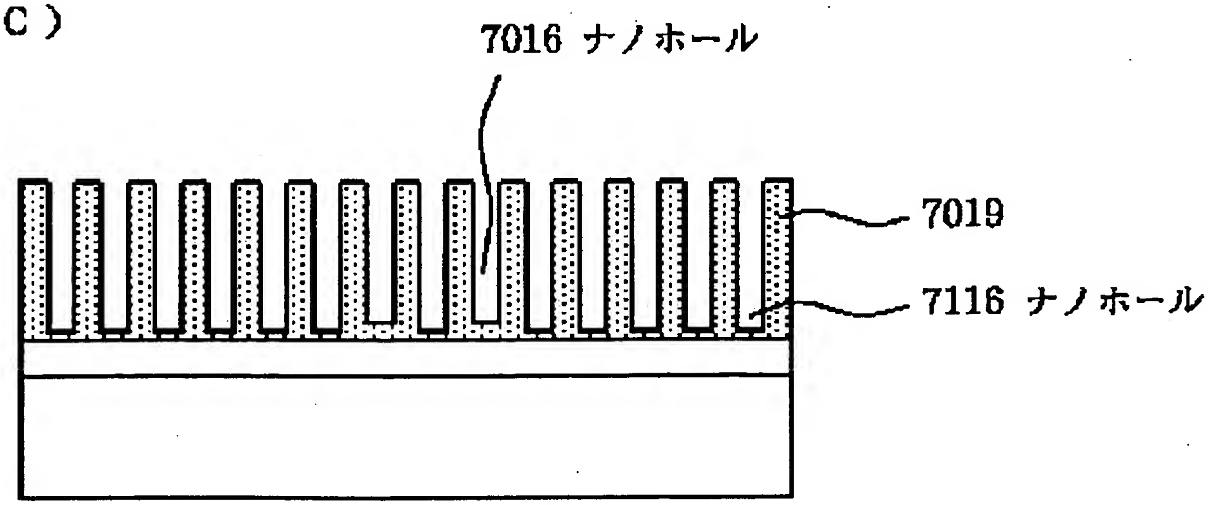

7013 アルミニウム
7012 下地層
7011 非磁性基板

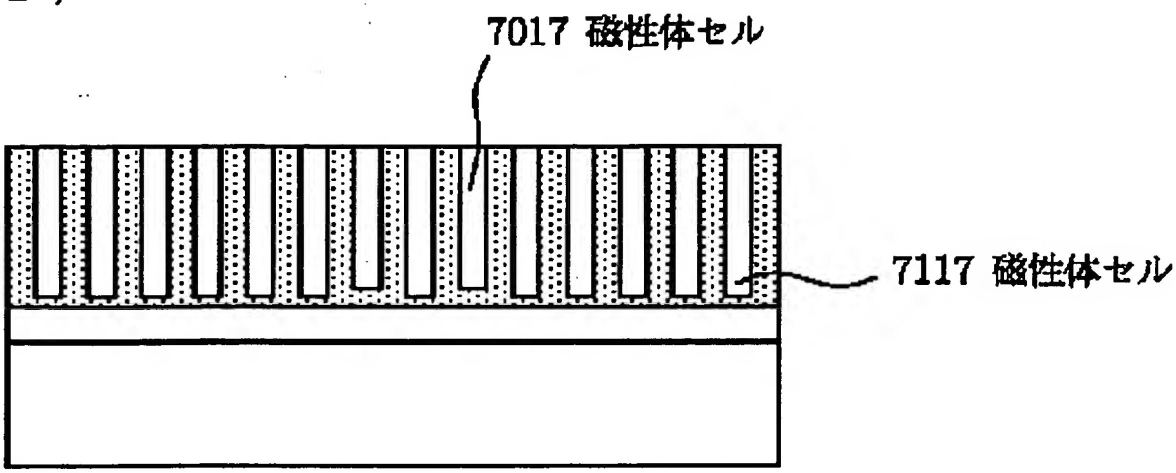
(B)


7014 窪み
7015 窪み

(C)


7016 ナノホール
7019
7116 ナノホール

(D)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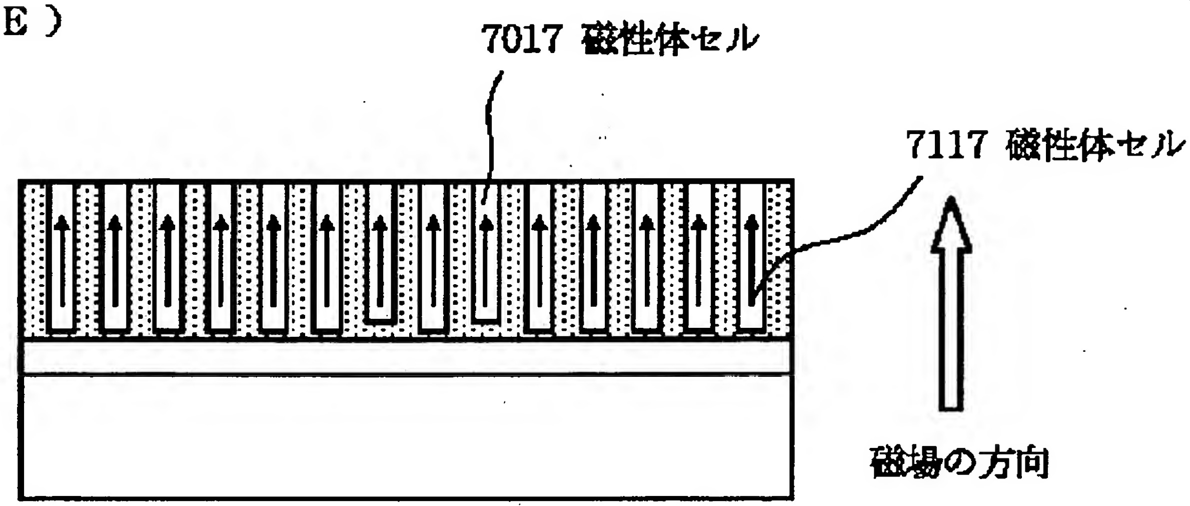
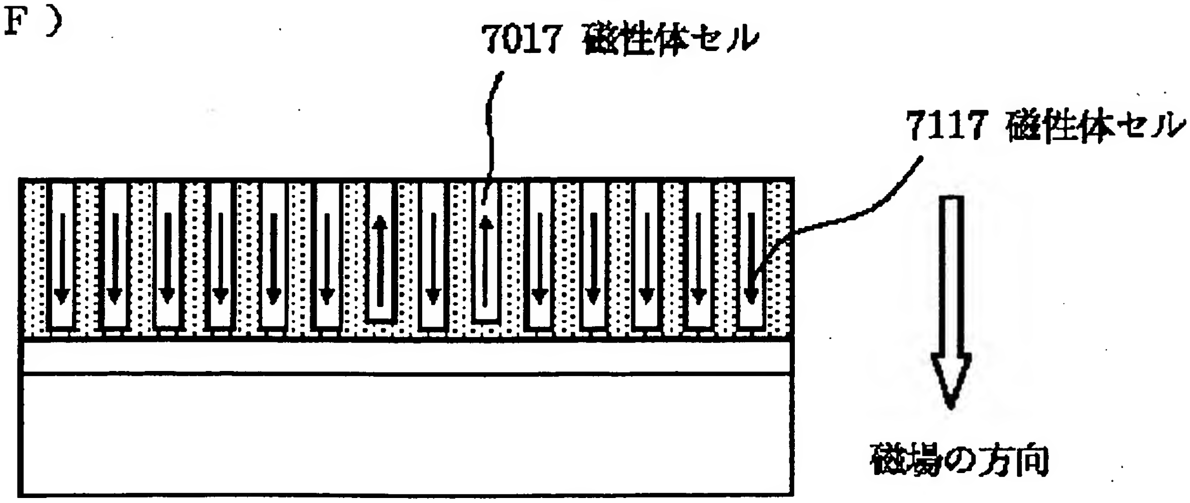
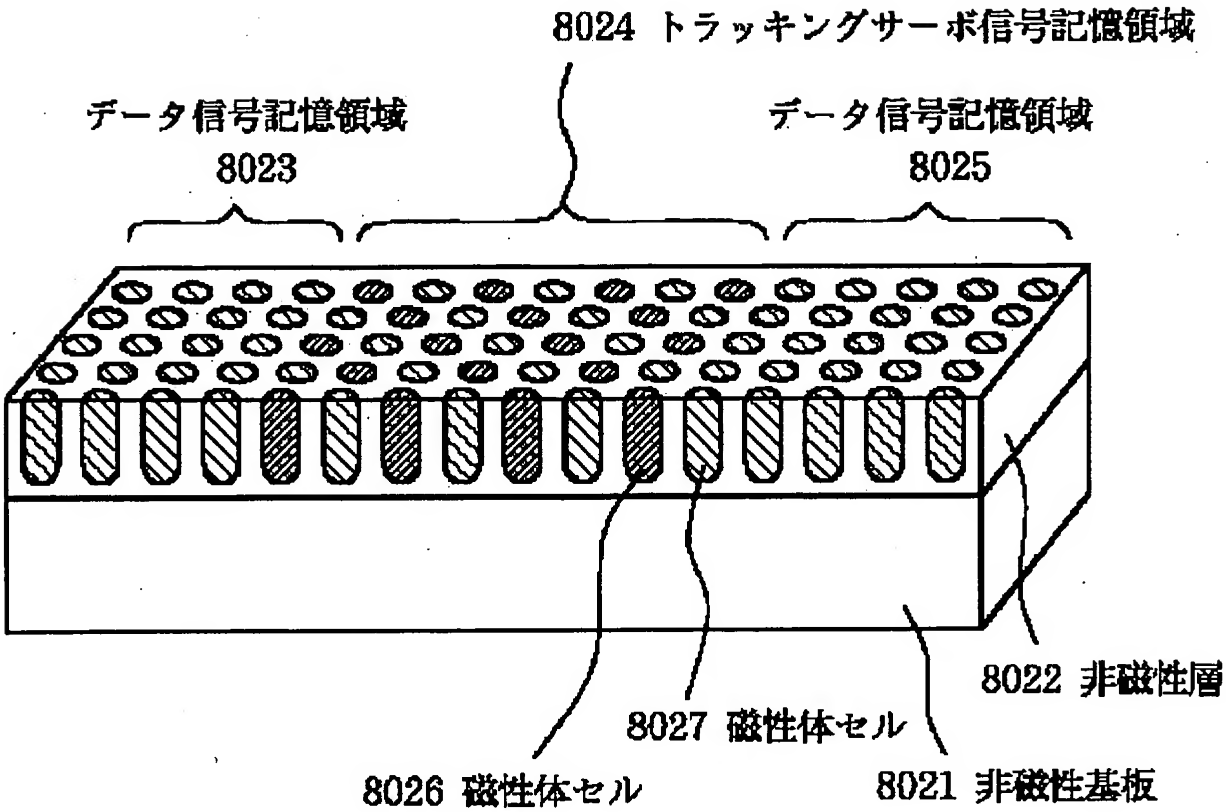
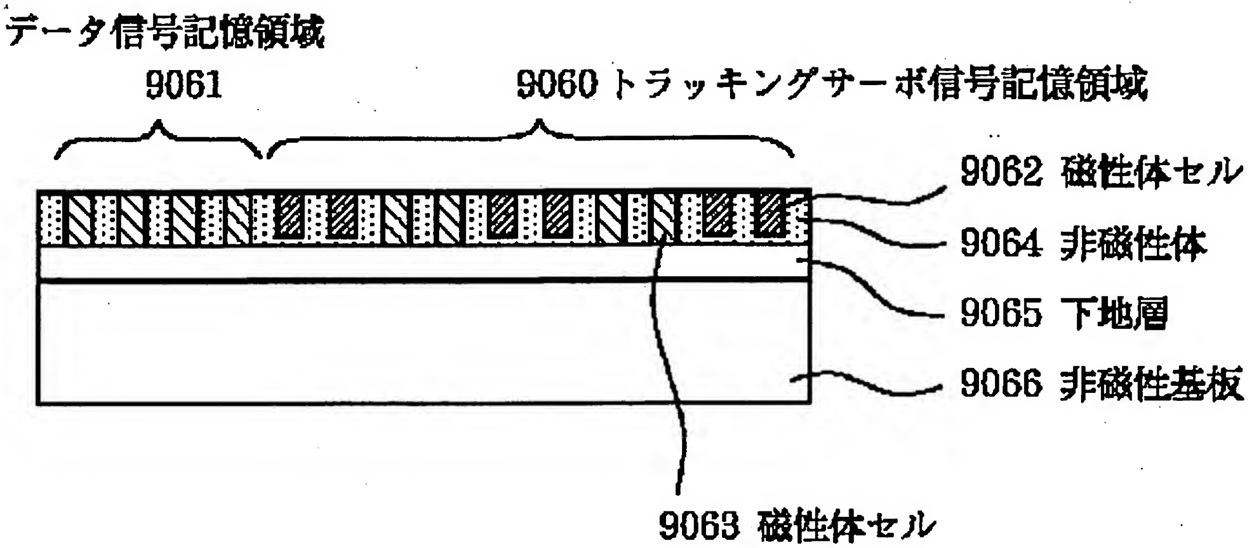
(E)

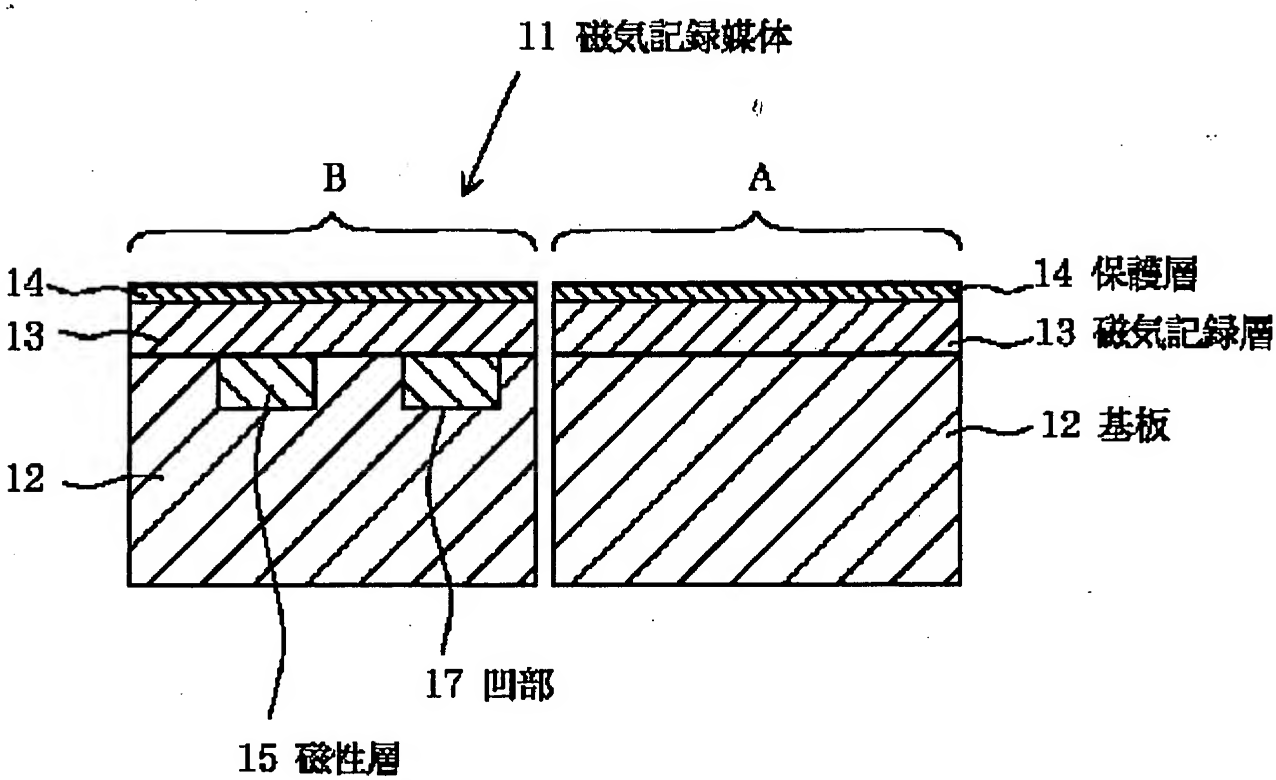

7017 磁性体セル
7117 磁性体セル
磁場の方向

(F)


7017 磁性体セル
7117 磁性体セル
磁場の方向


8024 トラッキングサーボ信号記憶領域
データ信号記憶領域
8023
データ信号記憶領域
8025
8022 非磁性層
8027 磁性体セル
8026 磁性体セル
8021 非磁性基板


データ信号記憶領域
9061
9060 トラッキングサーボ信号記憶領域
9062 磁性体セル
9064 非磁性体
9065 下地層
9066 非磁性基板
9063 磁性体セル


11 磁気記録媒体
B
A
14
13
12
14 保護層
13 磁気記録層
12 基板
17 凹部
15 磁性層

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